Weekly Activities Summary
Amendment 2 – Full Scale Field Demonstration
Interim Combined Acid Drainage Treatability Study Work Plan
Leviathan Mine Site
Alpine County, California

Week: July 15 – July 21, 2017

The following text describes field activities conducted during July 15 through July 21, 2017, to implement Amendment No. 2 to the Interim Combined Acid Drainage Treatability Investigation Work Plan, which Atlantic Richfield submitted to U.S. EPA on March 31, 2017.

INTERIM COMBINED TREATMENT OPERATIONS

OPERATIONAL SUMMARY

- On July 15 and July 16, 2017, the HDS Treatment Plant treated Pond 4 influent (comprised of mixed Upper Ponds and CUD/DS water) at variable flow rates between 100 to 143 gpm. Operating the HDS Treatment Plant at these flow rates and the higher acidity range resulted in greater than expected formation of a lime shelf / lime crusting in the Lime Sludge/Mix Tank and scaling of the flocculant dilution line. More frequent cleaning of the sludge recycle/waste lines was also required to maintain proper functioning. To address these maintenance issues, Atlantic Richfield began evaluating certain peripheral equipment modifications, as summarized below. Between July 16 and July 21, 2017, the HDS Treatment Plant operated at 100 gpm to maintain operational stability while the modifications were evaluated.

- Atlantic Richfield continued transferring water from Pond 2S and mixing with CUD, DS and Leviathan Creek water (as necessary) in Pond 4 to maintain the 2,600 – 2,900 acidity target until July 16, 2017. To facilitate evaluation of the equipment modifications, transfers from Pond 2S and Leviathan Creek were suspended between July 16 and July 21, 2017, while collection and conveyance of CUD and DS flows were maintained. This resulted in a gradual decrease in the acidity of the combined water in Pond 4 during this period.

- The HDS Treatment Plant equipment modifications being evaluated include:

    - Improving lime and sludge mixing in the Lime/Sludge Mix Tank and preventing the lime shelf formation on the sidewalls of the tank through installation of a treated effluent water jet;

    - Improving ease of cleaning/maintenance on the sludge recycle lines;

    - Improving ease of cleaning/maintenance on the sludge waste lines, and;

    - Modifying the flocculant dilution system to incorporate using fresh water instead of treated effluent to prevent scale build-up.

- Atlantic Richfield will implement the equipment modifications beginning during the week of July 24, 2017. Following completion of the modifications, Atlantic Richfield will resume water transfers from Pond 2S and Leviathan Creek (as necessary) to maintain the 2,600 – 2,900 acidity target in Pond 4 and increase the HDS Treatment Plant flow rate to 143. Atlantic Richfield expects to continue the field demonstration and operate the HDS Treatment Plant within the target criteria specified in the work plan until approximately August 31, 2017.

HDS TREATMENT PLAN OPERATIONS SUMMARY

- HDS Treatment Plant operations experienced the following short-term interruptions between July 15 and July 21, 2017:
    - Approximately 3 hours and 18 minutes on July 15, 2017, due to high turbidity;
    - Approximately 1 hour and 40 minutes on July 15, 2017, to replace the flocculant dilution manifold;
    - Approximately 35 minutes on July 15, 2017, to clean the reactor tank air blower lines;
    - Approximately 7 hours and 38 minutes on July 15 and July 16, 2017, due to reactor pH excursion;
    - Approximately 1 hour and 30 minutes on July 16, 2017, due to equipment maintenance;
    - Approximately 1 hour and 49 minutes on July 19, 2017, due to low effluent pH, and;
    - Approximately 10 minutes on July 20, 2017, due to equipment maintenance.
- The HDS Treatment Plant was placed in recycle mode returning effluent to Pond 4 following short-term interruptions between July 15 and July 21, 2017:
    - Approximately 1 hour and 15 minutes on July 15, 2017, following high turbidity shutdown;
    - Approximately 45 minutes on July 15, 2017, following the replacement of the flocculant dilution manifold;
    - Approximately 50 minutes on July 16, 2017, following reactor pH excursion shutdown;
    - Approximately 30 minutes on July 16, 2017, following equipment maintenance shutdown, and;
    - Approximately 1 hour and 35 minutes on July 19, 2017, following low effluent pH shutdown.
- The remainder of the time, the HDS Treatment Plant was discharging to Leviathan Creek.

- Capture and conveyance of the CUD and DS were maintained uninterrupted throughout this period.

SAMPLING SUMMARY

- HDS Treatment Plant ICT twice-weekly sampling was performed on July 19 and July 20, 2017, per the work plan.

- July 13 and 14, 2017, sample results are presented in Table 1. July 11, 12, 19, and 20, 2017, sample results are not yet available. A summary of the HDS Treatment Plant effluent field monitoring is presented in Table 2. Flow volumes recorded for the Channel Underdrain, Delta Seep, Leviathan Creek diversion, Upper Pond water transfer, and treated water discharged from the HDS Treatment Plant are included in Table 3.

- The sample results from the July 13 and 14, 2017, sampling events measured no effluent exceedances to the Average or Maximum MRAM discharge criteria. These sample events occurred at the modified pH setpoint of 8.3. The pH setpoint of 8.3 will be maintained for the duration of the field demonstration.

- Atlantic Richfield will continue to perform twice weekly sampling in accordance with the work plan for the duration of the field demonstration.

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TABLE 1
HDS TREATMENT PLANT - PRELIMINARY INTERIM COMBINED TREATMENT SAMPLE RESULTS
Leviathan Mine Site
Alpine County, California
Draft - Provisional Data

Parameter	Basis	July 13, 2017 UPCS-2 (mg/L)	July 13, 2017 HDSICT-1 HDS Influent (mg/L)	July 13, 2017 HDSICT-2 HDS Effluent (mg/L)	July 14, 2017 UPCS-2 (mg/L)	July 14, 2017 HDSICT-1 HDS Influent (mg/L)	July 14, 2017 HDSICT-2 HDS Effluent (mg/L)	Maximum Discharge Criteria[2] (mg/L)	Average Discharge Criteria[2] (mg/L)
pH (s.u.)[1]	Field	2.45	2.71	8.18	2.41	2.62	8.19	6.0 - 9.0	-
Aluminum	Dissolved	540	250	0.68	690	310	0.48 J	4	2.0
Arsenic	Dissolved	8.6	2.4	0.0016	9.2	2.5	0.0026	0.340	0.15
Cadmium	Dissolved	0.091	0.035	<0.001	0.087	0.037	<0.001	0.0090	0.004
Calcium	Dissolved	220	310	1500	260	360	1400	-	-
Chloride	Total	12	12	<10	12	12	<10	-	-
Chromium	Dissolved	1.4	0.53	<0.002	1.5	0.41	<0.002	0.970	0.31
Copper	Dissolved	2.9	1.1	0.0044	3.3	0.88	0.001 J	0.026	0.016
Hardness	Dissolved	810	1100	3500	930	1400	3900	-	-
Iron	Dissolved	1200	630	<0.50	1400	760	<0.50	2	1.0
Lead	Dissolved	<0.01	<0.005	<0.001	0.0042	0.0018	<0.001	0.136	0.005
Magnesium	Dissolved	76	85	77	99	100	68	-	-
Nickel	Dissolved	5.4	3.2	0.05	6.4	2.5	0.049	0.84	0.094
Selenium	Total	0.0067 J	0.0044 J	0.0021	0.0057 J	<0.02	0.0028	NP	0.005
Sulfate	Total	6200	3700	2800	6800	4200	3600	-	-
Zinc	Dissolved	1.3	0.82	0.003 J	1.1	0.74	<0.02	0.21	0.21
Acidity	Total	5700	2800	<2.0	5800	3100	<2.0	-	-
Alkalinity (Bicarbonate)	Total	<4.8	<4.8	10	<4.8	<4.8	9.5	-	-
Alkalinity (Carbonate)	Total	<2.4	<2.4	<2.4	<2.4	<2.4	<2.4	-	-
Alkalinity (Hydroxide)	Total	<1.4	<1.4	<1.4	<1.4	<1.4	<1.4	-	-
Alkalinity (Total)	Total	<4.0	<4.0	8.5	<4.0	<4.0	7.8	-	-
Total Dissolved Solids	Total	9500	5800	5200	9300	6000	4200	-	-
Total Suspended Solids	Total	32	52	6.3	10	43	240	-	-

Notes:
1. pH values are field measurements and are reported in standard units.
2. Discharge criteria and basis for maximum and average values are listed in the Request for Approval of Modification to the Removal Action at the Leviathan Mine Memorandum (U.S. EPA, 2008).

Abbreviations:
< - Constituents that were not detected are listed as "<" and the reporting limit is shown.
J - Results noted with "J" are an estimated value or were less than the reporting limit but greater than or equal to the method detection limit.
mg/L - milligrams per liter
NP - Not Promulgated
s.u. - standard unit

TABLE 2
HDS TREATMENT PLANT - EFFLUENT FIELD MONITORING
Leviathan Mine Site
Alpine County, California
Draft - Provisional Data

Date	Time	HDS Treatment Plant Effluent Field Monitoring			
		Flow (gpm)	pH (s.u.)	Dissolved Iron (mg/L)	Turbidity (NTU)
07/15/17	7:00 PM	123.0	8.38	0.03	1.4
07/16/17	6:00 PM	100.0	8.01	< 0.03	3.7
07/17/17	6:20 AM	100.0	8.28	< 0.03	3.3
07/17/17	7:00 PM	100.0	8.18	< 0.03	2.5
07/18/17	6:15 AM	100.0	8.50	< 0.03	10.1
07/18/17	4:30 PM	100.0	7.91	0.14	2.57
07/19/17	5:15 PM	100.0	7.81	0.06	2.26
07/20/17	6:45 AM	100.0	8.06	< 0.03	3.44
07/20/17	3:50 PM	100.0	7.73	< 0.03	2.73
07/21/17	7:45 AM	100.0	8.16	0.17	4.8
07/21/17	3:00 PM	100.0	8.05	< 0.03	4.1

Notes:
[1] HDS Treatment Plant influent flow rate measurements are calculated from flow totalizer volume measurements.
[2] Effluent pH values are field measurements and are reported in standard units.
[3] Dissolved Iron values are field measurements and are reported in mg/L.
[4] Turbidity values are field measurements and are reported in NTU.

Abbreviations:
gpm - gallons per minute
mg/L - milligrams per liter
NTU - Nephelometric Turbidity Units
s.u. - standard unit
< - less than

TABLE 3
INTERIM COMBINED TREATMENT VOLUMES
Leviathan Mine Site
Alpine County, California
Draft - Provisional Data

Date	CUD Collection Volume	DS Collection Volume	Leviathan Creek Diversion Volume	Upper Pond Transfer Volume	Treated Water Discharge from HDS Treatment Plant Recorded Flow[1,2]	
	(gallons)	(gallons)	(gallons)	(gallons)	(gpm)	(gallons)
7/15/2017	70,762	29,203	15,663	30,600	100	143,928
7/16/2017	70,790	30,773	6,199	21,000	100	127,786
07/17/17	70,872	21,409	0	0	100	143,766
07/18/17	70,911	20,729	0	0	100	143,523
07/19/17	71,055	21,852	0	0	100	97,019
07/20/17	71,083	20,656	0	0	100	143,175
07/21/17	71,117	20,654	0	0	100	143,959
Average Flow Rate or Total Discharged	496,590	165,277	21,862	51,600	100.00	943,156

Notes:

1. Treated Water Discharge recorded flows are calculated from flow totalizer volume measurements.
2. The operational flow rate is reported. Water discharge does not always occur 24 hours per day. The operational flow rate may also vary during the day.

Abbreviations:

CUD - Channel Underdrain
DS - Delta Seep
HDS - High Density Sludge
gpm - gallons per minute